

REMARKS

Claims 1-13 are all the claims pending in the application. Claims 8-13 have been withdrawn as being directed to a non-elected invention. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Drawings

The Examiner objected to the drawings because Figs. 39-42 do not appear to correspond with the figures discussed on page 1 of the specification. Accordingly, page 1 of the specification has been amended to correctly refer to Figs. 41-44.

Further, the Examiner requested that the figures discussed on pages 1-7 of the specification be designated by a legend such as --Prior Art-- because only that which is old is illustrated. Accordingly, Applicants have submitted herewith Proposed Drawing Corrections that label Figs. 41-45 as --Prior Art--.

Claim Objections

The Examiner objected to claim 7 as including informalities. Specifically, the Examiner asserted the phrase "large circumferential width dimension" is redundant. The Examiner suggested changing this phrase to "a larger circumferential width". Accordingly, Applicants have adopted the Examiner's suggestion.

Claim Rejections - 35 U.S.C. § 112

The Examiner rejected claims 2, 3, 5, and 6, under §112, 2nd paragraph, as indefinite.

With respect to claim 2, the Examiner asserts that "arc-shaped divided core portions" is indefinite because "it is not clear where the single 'abutting portion' (claim 1) is if there are plural divided core portions."¹ Applicants respectfully traverse this rejection because claim 1

¹ Office Action at page 3, item number 7, paragraph 1.

does not require “a single abutting portion” as asserted by the Examiner. Instead, claim 1 sets forth that the stator core is provided with “an abutting portion”. And because claim 1 uses the open transition phrase “comprising”, it is not limited to a single abutting portion; it may include one or more abutting portions. It is dependent claim 4 that sets forth “wherein only one said abutting portion is provided.” On the other hand, the claim 2 recitation of “arc-shaped divided core portions” may include more than one abutting portion. Yet claim 1 is broad enough to encompass both the claim 4 and the claim 2 recitations. Therefore, claim 2 is definite as written.

With respect to claim 3, the Examiner asserted that it is not clear what is the “core back”.² Applicants respectfully traverse this rejection because claim 3 is definite as written. For example, as shown in Figs. 6 and 33, embodiments of the invention include a core back 50, 85a, having a thickness t1. See also the paragraph bridging pages 13 and 14, for example.

With respect to claim 5, the Examiner asserted that “each of said stator core”, and “a radius of curvature” are each indefinite. Accordingly, Applicants have amended “each of said stator core” to --said stator core-- to clarify that it is the stator core which includes notch portions. Further, Applicants have amended claim 5 to clarify that it is the radius of curvature of the stator core that is reduced by the pressing force.

With respect to claim 6, the Examiner asserts that “inside teeth” is indefinite. Accordingly, Applicants have amended claim 6 to clarify that the abutting portion is formed inside --a tooth--.

Claim Rejections - 35 U.S.C. § 103

- The Examiner rejected claims 1 and 3-6 under §103(a) as being unpatentable over US Patent 5,955,810 to Umeda et al. (hereinafter Umeda) in view of US Patent 4,102,040 to Rich (hereinafter Rich). Applicants respectfully traverse this rejection because the references fail to

² Office Action at page 3, item 7, paragraph 2.

establish *prima facie* obviousness in that they do not teach or suggest every element as set forth in Applicants' claims.

Claim 1 sets forth an alternator comprising a rotor, a stator comprising a stator core surrounding the rotor, and a polyphase stator winding installed in the stator core, the stator core being formed with a number of slots, the polyphase stator winding comprising a number of winding portions in which long strands of wire are wound so as to alternately occupy an inner layer and an outer layer in a slot depth direction, the strands of wire folding back outside the slots at both axial end surfaces of the stator core.

For example, as shown in Fig. 2, one embodiment of the invention comprises a stator core 15 having slots 15a, a polyphase stator winding 16 comprising a number of winding portions in which long strands of wire 30 are wound so as to be folded back outside the slots 15a, and so as to be arranged at both axial end surfaces of the stator core. Because the strands of wire 30 are wound so as to be folded back at both axial end surfaces of the stator core, they do not interfere with each other. Thus, compared with the conventional coil end groups in which the end portions of the conductor segments were joined to each other, the height to which the coil end groups extend outwards from the stator core 15 can be reduced. Thus, wind resistance in the coil end groups is reduced, enabling the reduction of wind noise due to the rotation of the rotor 7. Further, coil leakage reactance in the coil ends is also reduced, improving output and efficiency.³

The Examiner asserts that Umeda teaches everything in Applicants' claim 1 except for an abutting portion on the core used to form an annular shape by joining core ends at the abutting portion.⁴ In contrast to that asserted by the Examiner and to that set forth in claim 1, however, Umeda fails to teach or suggest strands of wire folded back outside the slots at both axial end surfaces of a stator core. Instead, Umeda teaches an armature coil 50 that is comprised of three

³ Specification at page 18, line 19 - page 19, line 10.

⁴ Office Action at page 4, item number 9, 1st and 2nd paragraphs.

coil groups 51-53, wherein coil end groups 54 and 55 bridge the coils.⁵ That is, the coils 51-53 are only folded back at one axial end of the stator core 40.

The Examiner cited Rich as teaching a method of forming an alternator core stack.⁶ But Rich does not teach or suggest strands of wire folded back outside the slots at both axial end surfaces of a stator core. Therefore, even assuming, *arguendo*, that one of ordinary skill in the art were motivated to combine Umeda and Rich as suggested by the Examiner, any such combination would still not render obvious Applicants' claim 1. Likewise, Umeda in view of Rich does not render obvious dependent claims 3-6.

- The Examiner rejected claims 1-6 under § 103(a) as being unpatentable over Umeda in view of Japanese Patent 1-252141 to Shinichiro (hereinafter Shinichiro). Applicants respectfully traverse this rejection because the references fail to establish *prima facie* obviousness in that they do not teach or suggest every element as set forth in Applicants' claims.

Again, claim 1 sets forth an alternator comprising a stator comprising a polyphase stator winding comprising a number of winding portions in which long strands of wire are folded back outside the slots at both axial end surfaces of a stator core.

The Examiner asserts that Umeda teaches everything in Applicants' claim 1 except for an abutting portion on the core used to form an annular shape by joining core ends at the abutting portion.⁷ In contrast to that asserted by the Examiner and to that set forth in claim 1, however, Umeda fails to teach or suggest strands of wire folded back outside the slots at both axial end surfaces of a stator core.

⁵ Umeda at col. 7, lines 8-17.

⁶ Office Action at paragraph bridging pages 4 and 5.

⁷ Office Action at page 5, item 10, 1st paragraph.

The Examiner cited Shinichiro as teaching a stator core having plural arc-shaped divided core portions and an abutting portion.⁸ But Shinichiro does not teach or suggest strands of wire folded back outside the slots at both axial end surfaces of a stator core. Further, Shinichiro does not teach plural arc-shaped divided core portions. Instead, the reference numeral 4 is a tooth of a core. Therefore, even assuming, *arguendo*, that one of ordinary skill in the art were motivated to combine Umeda and Shinichiro as suggested by the Examiner, any such combination would still not render obvious Applicants' claim 1. Likewise, Umeda in view of Shinichiro does not render obvious dependent claims 2-6.

- The Examiner rejected claim 7 under § 103(a) as being unpatentable over Umeda and Rich, or Umeda and Shinichiro, and further in view of US Patent 4,692,646 to Gotou (hereinafter Gotou). Applicants respectfully traverse this rejection because the references fail to establish *prima facie* obviousness in that they do not teach or suggest every element as set forth in Applicants' claims.

Again, claim 1 sets forth an alternator comprising a stator comprising a polyphase stator winding comprising a number of winding portions in which long strands of wire are folded back outside the slots at both axial end surfaces of a stator core.

The Examiner asserts that Umeda, Rich and Shinichiro teach everything in Applicants' claim 7 except for stator teeth of different sizes.² As noted above, however, Umeda, Rich, and Shinichiro fail to teach or suggest strands of wire folded back outside the slots at both axial end surfaces of a stator core.

The Examiner cited Gotou as teaching a stator core having long and short teeth of different circumferential width.¹⁰ But Gotou does not teach or suggest strands of wire folded

⁸ Office Action at page 5, item 10, 2nd paragraph.

² Office Action at page 6, item 11, 1st paragraph.

¹⁰ Office Action at page 6, item 11, paragraph 2.

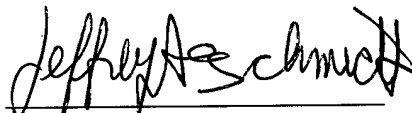
back outside the slots at both axial end surfaces of a stator core. Therefore, even assuming, *arguendo*, that one of ordinary skill in the art were motivated to combine Umeda, Rich, and Gotou, or to combine Umeda, Shinichiro, and Gotou, as suggested by the Examiner, any such combinations would still not render obvious Applicants' claim 7.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The specification is changed as follows:

On page 1, the 2nd full paragraph has been changed as follows:

Figure [39] 41 is a perspective of a stator of a conventional automotive alternator such as described in Japanese Patent No. 2927288, for example, Figure [40] 42 is a perspective showing a conductor segment used in the stator in Figure [39] 41, and Figures [41] 43 and 44 [42] are perspectives from a front end and a rear end, respectively, of part of the stator in Figure [39] 41.

The paragraph bridging pages 5 and 6 has been changed as follows:

Japanese Patent Laid-Open No. HEI 9-103052 discloses a stator 400 in which winding groups formed in a straight shape are inserted into a straight-shaped base core in a slot depth direction and the base core is bent into a cylindrical shape in a later process in order to improve the space factor of the conductors in the slots. Figure [43] 45 is an overall perspective of the stator 400 manufactured by this method. Although, insertion of the winding groups is significantly improved, because the winding groups have straight bridging portions extending circumferentially between the slots 401, the alignment of coil ends 402 extending outwards from the slots 401 is significantly poor, leading to increased radial dimensions and short-circuiting between the conductors in the coil ends 402. Furthermore, because the straight-shaped base core is made into a cylinder without modification, a significant amount of bending force is required and spring back is strong, leading to problems such as the formation of gaps at the joined surfaces in the resulting cylinder, and to deterioration in output and magnetic noise, etc.

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) An alternator comprising:

a rotor for forming north-seeking (N) and south-seeking (S) poles alternately about a rotational circumference; and

a stator comprising: a stator core surrounding said rotor; and a polyphase stator winding installed in said stator core, said stator core being formed with a number of slots extending axially at a predetermined pitch in a circumferential direction,

said polyphase stator winding comprising a number of winding portions in which long strands of wire are wound so as to alternately occupy an inner layer and an outer layer in a slot depth direction within said slots at intervals of a predetermined number of slots, said strands of wire folding back outside said slots at both axial end surfaces of said stator core, and

said stator core being provided with an abutting portion extending axially such that said stator core becomes an annular shape by joining ends of said stator core at said abutting portion.

5. (Amended) The alternator according to Claim 4 wherein [each of] said stator core is formed with notch portions for reducing a pressing force in a direction which reduces a radius of curvature of said core.

6. (Amended) The alternator according to Claim 5 wherein said abutting portion is formed inside a tooth [teeth].

7. (Amended) The alternator according to Claim 6 wherein:

said stator core is provided with teeth having different circumferential width dimensions;
and

said abutting portion is formed inside [teeth] a tooth having a larger [large]
circumferential width [dimensions].